

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 9612

Roll No.

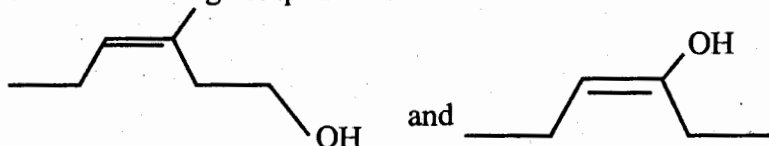
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B. Tech.**(SECOND SEMESTER) THEORY EXAMINATION, 2011-12****ENGINEERING CHEMISTRY****Time : 3 Hours]****[Total Marks : 100****Note :** Attempt the questions from each Section as indicated.**Section – A****10 × 2 = 20**1. Attempt **all** the following questions :

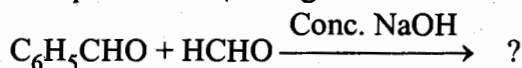
- (i) Define intra molecular hydrogen bonding. Give example.
- (ii) Why does graphite show conduction property ?
- (iii) Write the equation for $t_{1/2}$ of first order reaction.
- (iv) What do you understand by equilibrium potential ?
- (v) Define mesomeric effect.
- (vi) What is hyperconjugation ? Write the structural requirements for hyperconjugation.
- (vii) What are thermosetting resins ?
- (viii) Why does soap not give lather with hard water ? Write chemical reactions in support of your answer.
- (ix) Convert 50 ppm hardness of water in terms of mg/L and degree French.
- (x) Define chromophores.

Section – B**3 × 10 = 30**2. Attempt any **three** questions of the following :

- (a) (i) What are concentration cells ? Discuss in brief.
- (ii) A pure metal rod half immersed vertically in water starts corroding at the bottom. Explain why ?
- (b) (i) What do you understand by E-Z nomenclature ? Assign E, Z configuration to the following compounds :



- (ii) Complete the following reaction and discuss its mechanism.



- (c) (i) What do you understand by electronic transitions in UV-VIS spectroscopy ? Write the various electronic transitions in the order of increasing energy.
- (ii) What is basic principle of NMR spectroscopy ? An organic compound having molecular formula C_3H_7Cl gives two triplets and one hexet, write its structural formula and justify.
- (d) Write a note on conductive polymers.
- (e) Discuss the mechanism of Beckmann rearrangement reaction and also write its applications.

Section-C

All questions are compulsory :

$5 \times 10 = 50$

3. Attempt any **two** of the following:

- (i) Discuss the fundamental modes of molecular vibrations in IR spectroscopy. How do IR spectra help in differentiating the following compounds ?
(a) Aldehyde and ketone; (b) Carboxylic acid and ester.
- (ii) What is phase rule ? Write its applications in one component system (water).
- (iii) What do you mean by rate of a reaction ? Discuss the factors affecting the rate of reaction.

4. Attempt any **two** of the following.:

- (i) Derive and discuss the Bragg's equation.
- (ii) Define optical isomerism. Why do allenes show optical isomerism in spite of the fact that they do not contain achiral carbon ?
- (iii) Derive the equation for first order reaction.

5. Attempt any **two** of the following :

- (i) What do you understand by a metallic bond ? Discuss it on the basis of molecular orbital theory.
- (ii) Write a note on fuel cells.
- (iii) In a first order reaction, the rate constant is observed 8.5×10^{-7} at 8°C and 9.2×10^{-4} at 58°C . Calculate the energy of activation of the reaction.

6. Attempt any **two** of the following :

- (i) Describe the conformational isomers of n-butane. Also discuss the relative stabilities of the conformers.
- (ii) Discuss the working principle of Zeolite process for softening of hard water. Also write its merits and demerits.
- (iii) Write the drawbacks of raw rubber. Discuss the process of vulcanization of rubber.

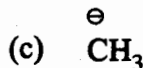
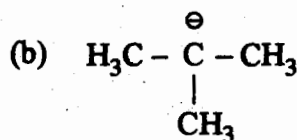
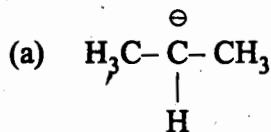
7. Attempt any two of the following :

- (i) Define high and low calorific values of a solid fuel. The analysis data of a solid fuel using Bomb calorimeter are given below :

Weight of crucible = 3.5 g; Weight of crucible and coal = 4.9 g; Water equivalent of calorimeter = 570 g; Water taken in calorimeter = 2100 g; Observed rise in temperature = 2.4 °C; Cooling correction factor = 0.045 °C; Acid correction factor = 50 Cal; Fuse wire correction factor = 3.5 Cal; Cotton thread correction factor = 1.5 Cal. Calculate HCV and LCV of coal sample.

Given: %H content = 1.0 and Latent heat of steam = 580 Cal/g.

- (ii) Define carbanions. Arrange the following according to decreasing stability.



- (iii) Complete the following reaction and discuss its mechanism.

